Understanding IBOC : Digital Technology for Analog Economics.

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Abstract

Radio's transition to digital transmission is well underway worldwide, with both terrestrial and satellite-based systems in operation. However, while most of the world implemented the terrestrial broadcast system known as Eureka 147, U.S. broadcasters swam against the global tide. The National Association of Broadcasters advocated adoption of the In-Band On-Channel (IBOC) system, which the Federal Communications Commission (FCC) ultimately approved as the U.S. standard, in the face of considerable engineering evidence that Eureka 147 was technologically superior. The NAB and FCC actions reflect the differing social, economic and political currents in the U.S. context, and demonstrate that technological diffusion may depend largely upon what causes the least disruption to existing industrial structures.

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Introduction

Although television's digital transition has attracted more scholarly and media attention, radio's switch to digital transmission is well underway worldwide, with both terrestrial and satellite-based systems in operation. However, while most of the world implemented the terrestrial broadcast system known as Eureka 147, U.S. broadcasters swam against the global tide. The powerful National Association of Broadcasters (NAB) trade association advocated adoption of the In-Band On-Channel (IBOC) system, in the face of considerable engineering evidence that Eureka 147 was technologically superior. In October 2002 the Federal Communications Commission (FCC) approved IBOC as the technical standard for terrestrial digital radio broadcasting in the United States (FCC, 2002b). The NAB and FCC actions reflect the differing social, economic and political currents in the U.S. context, and demonstrate that technological diffusion may depend largely upon what causes the least disruption to existing industrial structures. Put another way, the case of IBOC may be seen as an American attempt to make an omelet without breaking the eggs. This paper examines the reasons behind the U.S. embrace of IBOC, and its implications.

The worldwide penetration of Eureka 147 (hereafter referred to Eureka DAB, for Digital Audio Broadcasting) is already quite impressive: more than 284 million people can receive some of the 400 different DAB services available in more than 20 different countries. The only countries in the world which have preferred to develop their own, separate digital radio systems are the U.S.A. and Japan – and actually the Japanese ISDB-T (Terrestrial Integrated Services Digital Broadcasting) uses the same multiplexing system for audio and video, which was originally developed for Eureka DAB. (Piaskoski & Taherbhai 2001,1 ; Tanner 2002,3, World

DAB 2002; Fybush 2002) But American IBOC is really something different: a digital hybrid system based on current analog radio broadcasting.

So far, several different rationales for the development and implementation of IBOC have been presented. The NAB and iBiquity, the company behind IBOC, contend that this system was developed mainly because it will provide - unlike Eureka DAB- a cheap and easy transition from analog to digital radio (Fritts 2002, Struble 2002, Lavers 2000). On the other hand, the advocates of IBOC have also claimed that implementation of any digital radio system using new radio frequencies- such as Eureka DAB- could create tremendous turmoil in the U.S. radio industry. (FCC 1999, 15; Lavers 2000) World DAB, the international non-profit promotion organization for Eureka DAB thinks that the NAB opposition is based on three main reasons : 1) there is a lack of new spectrum, 2) American broadcasters dislike of sharing transmitters in the multiplex of a single frequency network and 3) broadcasters concerns that DAB would introduce new competition (World DAB 2002).

In current public discussion IBOC has also been seen as evidence of the economic power of the largest and most aggressive domestic radio industry in the world (Lavers 2000), as well as a result of certain structural or social differences of American and European radio markets (Hendy 2000a, Layer 2001, Selin 2002a). This paper will analyze the main arguments for developing IBOC and rejecting Eureka DAB in the U.S.

Digital Dilemma

Despite its worldwide presence, the diffusion of Eureka DAB has been rather slow because of regulatory and marketing problems (Lowe & Alm 2001,6-9 ; Edwards 2001,7; Piaskoski & Taherbhai 2001,2). There are no official numbers, but according to recent estimates only 400,000 receivers had been sold by early 2002, 52,000 of them in the UK (Yoshida 2002; Rigby 2002). The usual explanation is that the high price, large size, high power consumption and immobility of DAB receivers have kept consumer interest for new services low, but now smaller, cheaper and mobile receivers are coming to market (Lavers 2001; Edwards 2001, 5; Rigby 2002). At the moment, broadcasters all over the world are pondering how long it is going to take to attract an audience to digital radio – and moreover, which technology is going to make it happen?

Given (1998) argues that digital communication technologies “do not get invented in laboratories or backyards removed from social, economic and political processes as pure technological determinism would have us to believe” (28). Certain technologies mesh with particular purposes, and this is not coincidental. The character of a technology and the purpose for which it is used are fundamentally linked to the structure of the society (Lax 1997, 111, 120; Streeter 1996, 70-71; Walker 2001, 277). Technology in itself is not the driving force. Social, political and economic factors help to determine which advances in technology will be implemented. According to Winston (1998), “supervening social necessities” are needed to push technological inventions forward, while on the other hand, “the ’law’ of the supression of radical potential” means that these social forces may also effectively limit or inhibit development of technologies which might disrupt the pre-existing social relations (Winston 1998, 11-15, 341-342). This means - as Levy (1999) has noted – that “technological change tended more often to lead to minor reforms of existing institutional structures ….than to be used as an opportunity for a radical overhaul of either these institutions or hitherto shared policy objectives “ (122).

This theoretical approach helps us to see that although Eureka DAB is considered to be technologically excellent (FCC 1999, 7; O´Leary 2000, 209; Edwards 2001, 6-7) even among the supporters of IBOC (Dille 2002, Lavers 2000), that does not ensure its ultimate success. On the other hand, although it’s been important for incumbent U.S. broadcasters to develop a digital radio technology such as IBOC, no one can say if it is going to work in everyday life or succeed in the market. Our argument here is that, for certain historical reasons, U.S. radio is incapable of making the switch into digital with the technologically proven and already operational Eureka DAB system. The IBOC system, despite its problematic development, might represent the only possible digital solution without shaking the structure of the heavily concentrated U.S. radio industry and altering its basic economics.

Dueling DAB Systems

The result of a pan-European technology project, Eureka DAB received recognition from International Telecommunications Union (ITU) as a world standard in 1994 (Piaskoski & Taherbhai, 2001,1; Eurekadab 2002). It represents a new approach to audio broadcasting. While analog radio has certain problems with interference and fading, especially in mobile reception, DAB was designed to reduce these problems with digital error correction techniques. Eureka's DAB transmission stream is much wider than an analog radio broadcast stream, and thus carries much more information. Eureka DAB is also able to broadcast digital text, pictures, hypertext mark-up language (HMTL) pages or compressed video along the audio signal. Thanks to digital compression, it is spectrum efficient. Eureka DAB makes it possible to use a single frequency and single transmitter to carry several digital signals simultaneously, combining them through a multiplex. This system is known as a Single Frequency Network (SFN). Different kinds of information signals need different amounts of bandwidth, which means that every transmitter - whether terrestrial or satellite - can deliver five CD-quality audio channels or five FM- quality audio channels with additional data (Lax 1997,13,35 ; O'Leary 2000, 210 –219 ; Tanner 2002, 4-5). Eureka DAB is also an open standard, which means that broadcasters may use the system without paying licensing fees to the developer (O'Leary 2000, 213; SADIBA 2002). (In contrast, iBiquity, the developer of the IBOC system, intends to charge stations a fee for utilizing IBOC [Pizzi 2002c].)

An important characteristic of Eureka DAB is the deep involvement of national public service broadcasters. They have been central to the development of the infrastructure for digital audio broadcasting, first in Europe and later all over the world. Where public broadcasting has been the strongest, so too have digital radio services been "most thoroughly established" (Hendy 2000a, 50; Hendy 2000b, 215), although the overall diffusion rate of the system has been faster in those countries where the commercial sector has also gotten involved (Lowe & Alm 2001, 9; World DAB 2001, 6-14). In this context, it is not a surprise that digital radio using Eureka DAB serves the political and economic interests of the largest national and regional broadcasters rather than those of small-scale local and community radio - despite the fact that DAB actually increases the number of channels available (Rudin 1999, 31-43,51-53; Hendy 2000a, 59; Hendy 2000b, 231-233). However, because this multiplicity of channels further fragments an already splintered radio audience, digitalization with Eureka DAB may threaten the viability of traditional broadcasting -- and especially the public service sector -- unless regulators enact protectionist policies (Given 1998, 51-63; Hendy 2000b, 229-230).

Ironically, during the late 1980s and early 1990s, the U.S. radio broadcasting industry was considering Eureka DAB for digital terrestrial radio broadcasting (Layer 2001). Although the NAB recommended the adoption of Eureka DAB for the U.S. at its 1991 convention, within months the U.S. industry concluded that a different kind of system would be needed (Howard 2001). Westinghouse, an American electronics and military industry giant with some radio ownership, initiated development work on an IBOC –type system soon after the introduction of Eureka DAB (Lavers 2000). In 1991, Westinghouse Electric, CBS and Gannett formed a limited partnership called USA Digital Radio (USADR) to create a digital radio system, which could be utilized on already allocated AM and FM radio wavebands. AT&T and Amati Communications set up a competing partnership with similar objectives (Lavers 2000; Layer 2001).

Although the NAB and corporations behind IBOC development noticed very quickly that Eureka DAB would be, in the words of a U.S. broadcasting executive, a “marketer's nightmare” (Dille 2002) for its explosion of channels, the American consumer electronics industry was not able to identify the fundamental “defects” of Eureka DAB with similar ease. On the contrary, the electronics industry found Eureka DAB technology to be superior to other DAB proposals in 1997 tests, while the technical results of IBOC development remained poor (FCC 1999, 5-7; World DAB 2002). Through the years at least 19 different proposals for IBOC or IBAC (In-Band, on Adjacent Channel) technology failed (Edwards 2001,4; Layer 2001). Despite these setbacks, the NAB had already made its decision. The Consumer Electronics Association (CEA) trade group proposed a system called MMBS (Multimedia Broadcasting System), which took a similar approach as Eureka DAB, but the NAB rejected this idea, also (Stimson 2002b).

The basic idea of IBOC is that the digital signal is transmitted on both sides of the existing analog radio signal. For example, an analog FM signal needs only about half of the frequency bandwidth it has available, and the so-called sidebands, have usually been left unused to provide protection from interference. By using sidebands for the digital signal, it would be possible to broadcast simultaneously a standard analog signal, plus one near- CD-quality digital signal and a small amount of additional data (Lavers 2000; O’Leary 2000, 229-230; Morris 2001, 1-3, Tanner 2002). However, IBOC designers incorporated a so-called “blend-in analog“ feature in the current generation of IBOC. This means that if the digital signals on both sidebands start to fail, they are backed up with the analog signal so that the digital receiver may transfer seamlessly into analog reception (Layer 2001). This solution probably makes reception more reliable, but it also means that the digital audio service, at present, cannot do anything more than duplicate the analog service. In the next stages of development IBOC engineers hope to increase the data capacity of the digital audio signals and thereby provide additional digital transmissions (Tanner 2002,2).

The IBOC developers started to consolidate as soon as the FCC initiated proceedings about terrestrial digital audio broadcasting in November 1999, a year after USADR had proposed adoption of an IBOC system (FCC 1999, 2, 19; Lavers 2000; Layer 2001). In December 1999 USADR formed a strategic alliance with Digital Radio Express (DRE), and in July 2000 the last two remaining developers of IBOC–technology, USADR and its former partner and current competitor Lucent Digital Radio, merged, forming a sole IBOC development company, iBiquity Digital Corp. (Lavers 2000 ; Layer 2001). After these mergers, iBiquity's IBOC was the only game in town, and the FCC could not choose between different IBOC proposals (FCC 1999, 5,21).

IBOC was formally presented to the broadcasters at the 2002 NAB convention as a fully operational system for digital broadcasting, although there's no "real world" experience with IBOC involving consumer model receivers. However, the biggest problem with the IBOC image was that only the FM-IBOC had the full endorsement of National Radio Systems Committee (NRSC), while the AM-IBOC was endorsed for daytime use only, because of interference problems. According to some AM broadcasters, broadcasting in digital during daytime hours only would be untenable, and would force them out of business (Albiniak 2002). Originally, IBOC was promised to represent an important upgrade of sound quality for AM broadcasters, in practice equal to FM broadcasters (FCC 1999, 5,10,14; Howard 2001; Merli 2001). In this context, it seems that the launch of IBOC in April 2002 was primarily meant to offset the growing concern about digital satellite radio among Wall Street investors (Stimson 2001, Scherer 2002; Pizzi 2002b).

Two U.S. firms -- XM Satellite Radio and Sirius Radio -- launched subscription services in 2001 and 2002, respectively, that provide direct satellite-to-car or satellite-to-home broadcasts (Taub 2003). Both offer more than 100 music and talk channels, most commercial free, for a monthly fee. The lure is narrowcast channels that are not economically feasible for commercial radio, from opera and comedy formats to gay and lesbian programming, as well as channels that break down traditional genres, such as the 12 rock channels offered by XM. Sirius and XM entered into partnerships with auto manufacturers to offer their services in many 2003 car models. XM claimed 360,000 subscribers in January 2003 while Sirius was withholding similar data; both firms, however, experienced declining stock prices in 2002 (Taub 2003).

IBOC: A Cheaper and Easier Transition?

Just as the name suggests, the most important single feature of IBOC technology is that it is designed to bring digital audio transmissions to the same radio waveband -- and to be exact, to the same frequencies on which the stations already operate. IBOC stations will use practically the same spectrum space as before, obviating the need for any new frequency allocations for digital radio (FCC 1999, 15; Struble 2002). This solution has several consequences. First of all, because there is no need for a new licensing round for new separate digital frequencies, there is no risk of new operators, uneven sharing of the new frequency spectrum or – the broadcaster's worst-case scenario -- an expensive license auction for broadcast radio. Promoters of IBOC have argued that adopting Eureka DAB in the U.S. would have required an auction for new digital radio frequencies (Hazlett 2001, 110; Lavers 2000).

Although the National Telecommunications and Information Administration (NTIA) estimated in 1990 the value of spectrum used by U.S. broadcasters to be $ 115 billion (half of the estimated sale price of all stations) (Hallikainen 2000, 5-7), the U.S. terrestrial broadcast industry has never paid for its spectrum space. However, FCC broadcast licenses have always had a high “aftermarket” value (Streeter 1996, 230-231), which in practice has been much more than half of the station’s market price. The idea of allocating radio licenses by spectrum auction was presented back in the 1950s (Coase 1959,14-18), but it was not until 1993 that Congress first directed the FCC to auction licenses for unused, non-broadcast portions of the spectrum (Hazlett 2001, 19,41). (The transition to digital television using new spectrum is underway in the U.S. without requiring broadcasters to pay for new digital licenses [FCC 2002; Hazlett 2001, 126]).

The lack of spectrum space for new wideband Eureka DAB signals has also been mentioned as a justification for IBOC (Layer 2001, Selin 2002a,67; Barboutis 1997). But the lack of suitable new spectrum space for digital radio in the U.S. was not a big issue in early 1990s: the FCC actually suggested three different spectrum options for DAB (FCC 1999,3-4; Hilliard & Keith 2001, 268; Hazlett 2001,36). Despite this, the development of IBOC was initiated in 1991 by an important U.S. manufacturer of defense avionics devices, Westinghouse (Lavers 2000). The following year, at the World Administrative Radio Conference of 1992, unlike virtually every other country, the United States did not reserve so-called L-band frequencies for digital audio broadcasting (the U.S. instead reserved the S-band, which is now designed for satellite digital radio). This decision was made in the name of protecting the interests of the U.S. military and civilian aerospace industries, which used L-band for testing aircraft and missiles (Rossow 1993, Kissack 1997). These industries had previously switched wavebands in the early 1970s, which cost about $ 641 million (AFTRCC 1996).

It was certainly in Westinghouse’s direct interest to keep the L-band only for testing purposes, but on the other hand this decision also resulted a continuing, steady scarcity and increasing value of available radio broadcasting frequencies (Hazlett 2001,117-118). In mid-1990s Westinghouse radically changed its business strategy and started to exploit the L-band decision by turning to radio (as well as television) broadcasting. In 1995 it bought CBS; in 1996, Westinghouse sold its Defense and Electric Systems to Northrup Grumman and later same year bought Infinity Broadcasting, which was then the second biggest radio corporation in the U.S.(Massey 1997a, Massey 1997b). Later Westinghouse changed its name to CBS Corporation, and after a few more acquisitions in 2000, CBS Radio (Infinity) had about $15 billion invested in radio stations in the U.S. (Croteau and Hoynes 2001, 75-80; Lavers 2000).

However, practically speaking, the lack of L-Band spectrum is not a reason to reject Eureka DAB in the U.S. The system works well on a wide range of frequencies,[1] for example on VHF–frequencies, which are in many countries used for analog TV operations, and in the U.S. for land mobile and amateur use (FCC 1999, 6-7). Actually, VHF is already used for Eureka DAB operations in several countries, for example in Great Britain and Finland. (O'Leary 2000, 214-216; Tanner 2002,5, YLE 2002). On VHF a single Eureka DAB transmitter can cover an area the same size as five or six Eureka DAB transmitters on L-Band. This is the reason why national broadcasters with an obligation for universal service tend to start DAB operations on VHF, while private broadcasters, targeting smaller, lucrative markets, tend to go on L-band (Tanner 2002,10; Lavers 2000).

Finally, a considerable number of VHF and UHF frequencies should become available in the U.S. after the next five years, as TV broadcasters give up their analog channels, currently scheduled for the end of 2006. The Consumer Electronics Association has been lobbying for allocating these frequencies for DAB, but according to the FCC, these frequencies have "already been allocated for public safety, police and fire usage at that time in the future" (World DAB 2002, FCC 2002). However, during the Clinton administration, in 1999 the FCC itself suggested reallocating TV channel 6 (82-88 mHz) for so called "new- spectrum DAB" (FCC 1999, 17-19).

The radio industry has also emphasized that the existing 550 million analog radio receivers in the U.S. will not become obsolete after the digital transition to IBOC. Old radios can still provide the same service as before, because stations will not move to another radio waveband (FCC 1999, 9-10; Layer 2001, Fritts 2002, Dille 2002). However, the fact that the digital part of IBOC services – just as with other digital radio service -- can be received only with a special receiver, challenges the idea that IBOC would provide a more “seamless” transition to digital (Howard 2001). Existing analog receivers will not be able to provide any new digital services, but iBiquity is only trying to make a virtue out of necessity. Because the analog and digital audio program services in IBOC must be simulcast (Layer 2001; Edwards 2001, 5), the company may argue that you can still get all the same services as before. But it also means that the broadcasters cannot promise the listeners any new kind of audio content in return for buying a digital receiver. However, for the broadcasters the transition may seem easier, if there is no need to modify the marketing name of the station (e.g. Z100), and especially because the digital audience on a familiar frequency would be included in the Arbitron ratings for their analog broadcast.

Ultimately, the NAB and iBiquity wanted the FCC to set a single standard for IBOC as the U.S. national digital radio system to avoid the fate of AM stereo (FCC 1999, 19-21; Fritts 2002; Struble 2002; Stimson 2002a). Twenty years ago the FCC did not set a standard for AM stereo and decided to allow the marketplace to choose the standard; after AM stereo foundered for a decade, in 1992 the FCC was instructed by the Congress to finally set a standard for AM Stereo (Sosa 1998, 129-135). The transition to digital is far more essential to the U.S. radio industry than AM Stereo, and this is the reason why it could not afford – despite its usual deregulatory enthusiasm -- to leave this decision to the marketplace (Lavers 2000). The free-market entrepreneurs feared that the market could end up making the “wrong” choice. However, all markets are secondary institutions, which do not exist for long without government action and intervention. There has to be enough social trust to build up a market and keep it going, which is why business needs and accepts some amount of regulation. That is why the U.S. radio industry has always needed the services of the FCC in some fashion (Coase and Johnson 1979, 47-53; Picard 2002, 69-70; Rifkin 2001, 226, 243).

IBOC as a "Digital Thermos "

Both Eureka and IBOC have been justified in terms of enabling broadcast radio to remain competitive in a digital world -- especially so in the U.S. case because of the challenge from subscription satellite radio. "It would be harder to combat satellite if terrestrial stations still broadcast analog signals," says iBiquity president Robert Struble (quoted in Stimson 2001). This statement has a strange logic, because the analog signal is crucial to the IBOC system. On the other hand, it is questionable if the best strategy for a terrestrial broadcasting station is to launch new services which cannot be received without a new receiver, and yet provides essentially the same program content.

According to NAB President Edward Fritts, IBOC provides a way to "offer better quality radio" (Fritts 2002). From several perspectives, this could be a valid argument for digital radio in general. The digital promise so far has been more choice, more listener sovereignty and more interactivity (Hendy 2000b, 216), not to forget "the interference-free reception of high quality sound" (Eureka 147 1998; Layer 2001). However, closer examination of IBOC technology and the evident consequences of its future implementation in American broadcast radio market suggest opposite results. Because IBOC uses already allocated radio bands and frequencies already licensed to incumbent broadcasters, the introduction of terrestrial digital radio in the U.S does not necessarily lead to new radio channels or new program services. Unlike Eureka DAB, IBOC would not provide any spectrum recovery in current radio broadcast bands and it would not create any new bandwidth capacity (Pizzi 2002a). On the contrary, the implementation of IBOC means that there will be even less spectrum space left for new operators or services in the current FM dial.

Here we probably find an important reason for the NAB's fierce opposition against the new low-power FM radio (LPFM) services (Stavitsky, Avery & Vanhala 2001). While the noncommercial community stations may decrease somewhat the audiences of commercial stations, their small transmitters squeezed in between commercial operators' frequencies could potentially interfere with IBOC signals on the channel sidebands. (FCC 1999,12; Stavitsky, Avery & Vanhala 2001, 340-341; Tridish & Hammersmith 2000; Hazlett 2001, 68-71). From the NAB perspective, LPFM provides a real threat to the digital transition with IBOC (NAB 2000). It is ironic that a recent government report about digital radio in Sweden suggested that small low-cost FM operations will still in the near future be important, especially for community radio broadcasters, because of their limited ability to invest in digital radio (Selin 2002b,2-5). Rudin (1999) speculated with the idea that one reason for the U.S. radio establishment's "lack of enthusiasm" for Eureka DAB might be the fear that the system could allow for creation of socially and politically challenging and subversive new radio services (Rudin 1999, 44-45). IBOC is a neat way to prevent such services, both on the current analog FM dial and in the digital future of U.S. radio. It is most likely that the economic objectives of current broadcasters are the primary factor for creating IBOC, but as usual politics and economics are tightly intertwined. Pursuit of certain economic interests also serves political objectives and vice versa.

IBOC was launched more for defensive reasons than offensive reasons. Using the words of radio group executive John Dille, it is "a digital thermos bottle" (Dille 2002), created to preserve the current situation and keep the markets in the hands of incumbent broadcasters (Selin 2002a, 66-67, 109; Hendy 2000a, 50 ;Tridish & Hammersmith 2000). It illustrates vividly Winston's "law of the suppression of the radical potential." Although Eureka DAB is a technology that does not have much radical potential in the European context, the potential exists in the different social relations of the U.S., where many activists feel disenfranchised by the highly centralized, corporatized radio industry (Stavitsky 1994; Stavitsky, Avery & Vanhala 2001). The introduction of Eureka DAB, together with the emergence of satellite radio, was the supervening social necessity which fostered IBOC (Rudin 1999,51-53; Hendy 2000a, 59; Winston 1998, 11-12; 341-342). Viewed this way, IBOC represents less a new competitive digital broadcasting technology than a tool for stabilizing industrial structure. As consultant Skip Pizzi (2002a) notes:

> “ Along the way, all the iterations of IBOC formats developed by USADR, and now by iBiquity, have been reverse-engineered to prevent the opportunity for emergence of any new services that might further fragment the listening market. Rather than competing on the basis of attracting listeners with a quality product, the systems have been designed to preserve scarcity as a means of securing success. The motto has been, ‘Let digital come, but let it do nothing to displace or dilute the existing marketplace.´ “

“Possessing” the Air: Whose Property?

According to Streeter, “the principal organizational unit in American broadcasting is the station, and a station is something that is owned, bought and sold” (1996, 219). A station is not only equipment and studios, it is an arbitrary social creation – a combination of facilities and a particular channel, legally constituted and protected with a scarce, government-issued broadcasting license (Streeter 1996, 221). A license represents access to the radio spectrum, which is required of all commercial broadcast operations. Although the U.S. Communications Act strictly forbids ownership of radio spectrum, it invites broadcasters to treat it as private property -- and the practice of using licenses to create and protect transferable stations has in practice turned the broadcast spectrum into a form of real estate (Streeter 1996, 221-230).

The broadcast frequency market in the U.S. was steady for several decades and the ownership of stations was quite dispersed, thanks to national ownership caps. This scattered structure provided great economic flexibility to U.S. commercial radio, and enabled the industry to adapt to the ascendance of television in the 1950s. The local stations and small entrepreneurs were able to figure out new business models for commercial radio. However, expansion was difficult. There were ownership caps and antitrafficking rules, but broadcasters were also unable to put a lien on their FCC licenses in order to get bank loans: this was considered unlawful (Krasnow and Argento 1996).

All this changed in the 1980s, when the FCC started to lift the ownership caps and repealed antitrafficking rules. After these deregulatory changes, "Wall Street financiers and the financial community in general began to view radio station licenses as marketable assets with potential investment value. Radio stations now had greater liquidity and became a more tradeable commodity" (Ditingo 1995,3). This meant that money for mergers and acquisitions, which used to be hard to get, came pouring in and radio stations became chips in a bigger game (Le Duc 1987,109; Ditingo 1995, 2-5; Douglas 1999, 296-297). Broadcast licenses were then understood to be "property of the estate in which a security interest may not be granted, but the proceeds of the license are subject to a security interest" (O'Leary 1999). The rejection of Eureka DAB in favor of IBOC was crucial in order to keep broadcasting stations as separate, easily marketable properties, and most of all to retain their market value through scarcity. At the moment, there are not enough stations available for the number of potential buyers -- "a station is like a beachfront property: there are only a limited number of them " (Patrick 2002).

Because the stations usually operate in leased office facilities, and the value of used studio and transmission equipment is relatively low, the most valuable assets of a radio corporation are the FCC licenses. In the case of Entercom, the asset value of its 100 radio station licenses constitutes 85 percent of the corporation's $1.438 billion in total assets (Entercom 10-K, 15, 29). In other radio companies the ratio can be even higher, but this great disparity of market value and book value – the so-called high Q ratio -- is nowadays unremarkable when compared to, for example, Microsoft (Rifkin 2001, 50-51). But a very important difference is that while software companies are basically in the business of creating new intangible assets, the big radio companies are merely in the business of owning and exploiting scarce intangible assets, which were originally created by government licensing actions (Hazlett 2001,106).The recent process of building huge national radio giants has meant that these companies have paid more and more embarrassing amounts of money, primarily for hundreds of FCC broadcasting licenses, whose market value is based on their scarcity and revenue potential (Hazlett 2001,117-118; Bates 1998,89). Because of this empire building, these corporations carry a severe debt load. Moreover, they now have to convince their owners – private stock holders and venture capitalists -- about their ability to produce steady or growing short-term return on investment every three months.

Consider this scenario: a rapid decrease in the market value of current broadcast licenses because of increasing supply, increasing audience fragmentation because of multiple new channels, and consequently, declining cash flow from advertising and large new investments: This could be catastrophic for big broadcast corporations heavily in debt. Even if new broadcast licenses in another radio band would be free of charge, the short-term asset and resale value of formerly expensive licenses would temporarily collapse because of the large number of channels available, which in turn would damage the broadcast corporation's ability to get necessary financing (Hazlett 2001,72, 117-118, Picard 2002, 333-234).

This is the fundamental reason why the American radio industry desperately needs IBOC technology to protect the asset value of current broadcast licenses and the value of the corporate stock. Although IBOC lacks the potential for building new long-term value that Eureka

DAB has (Trowsdale 2002,3), it has been seen as the safer choice. In a context where the market is allowed to "regulate" itself, Eureka DAB could bring other risks: the control of bandwidth could shift from the broadcaster to the controller of the digital multiplex, from whence the signals are transmitted; and moreover, it is likely that the companies that purchase multiplex licenses could charge others for the use of bandwidth. This would be analogous to a TV station being forced to pay for carriage on cable systems. The central economic model of commercial broadcast radio, which is based on selling audiences to advertisers is already declining (Napoli 2001,71), and digitalization of terrestrial radio *without IBOC* could accelerate this development.

The U.S. radio industry is – as Hendy (2000a, 239) suggests about commercial radio worldwide -- in the business of minimizing risks. Unfortunately, IBOC is not totally convincing as a digital defense, because sometimes the avoidance of all possible risks poses the greatest risk of all. Despite all the enthusiasm about digital convergence, the strategic choices the U.S. radio industry has made so far do not reflect this idea very well. Is U.S. radio with IBOC really in the business of digital communication – or rather only in the business of radio? If IBOC succeeds, might it foreclose possible advances in the traditional radio business in the U.S.?

Radio's third chance? [2]

The American radio industry has not been reluctant to consider Eureka DAB simply because it was originally an European system. A closer look at the history of technological diffusion reveals that U.S. broadcasters have fiercely opposed other improvements of radio technology -- even those of domestic origin -- following faithfully Winston's law of suppression of radical potential. American inventor Edwin H. Armstrong developed FM technology in the 1930's, but this static-free system, with sound quality superior to AM, was seen as a threat to existing AM markets of commercial network radio, as well as RCA's patent monopoly for AM technology and AT&T's program distribution business. Further, it would have required people to buy new radio receivers -- while for RCA it was more important to get them to buy television sets (Winston 1998, 78-79; Douglas 1999 257-263; Walker 2001,45-48; Hazlett 2001,49-53).

There are many parallels between the introduction of FM and that of digital radio -- and the response of commercial radio has also been similar: rejection of more advanced solutions and new channels. RCA and its allies used their power and influence to thwart FM technology, which resulted in, among other things, spectrum allocation problems for the new FM service. This policy of prevention succeeded so well, that FM operations had no commercial importance in the U.S. until the late 1960s. But after progressive rock brought young audiences to FM, the tide turned and FM listenership surpassed AM (Ditingo 1995, 18-19, 59-63; Douglas 1999, 262-263; Walker 2001, 46-48; Hazlett 2001, 50-53). It is a great irony that now, seventy years later, once powerful RCA is almost forgotten (Bilby 2001, 263) and the most lucrative properties of the U.S radio industry are dependent on the FM technology that the industry once tried to suppress to protect its own short-term interests.

Even if broadcasters and regulators would evaluate these two digital systems, Eureka DAB and IBOC, simply as different technological platforms for digital audio broadcasting, the implementation of these systems would have distinctive social, political and economic consequences. If we assume, like the FCC, that the implementation of terrestrial digital radio serves the public interest, we should still question what kind of DAB would best serve the public interest. Critics such as Rudin (1999), Hendy (2000a and 2000b) and Selin (2002) have pointed out that Eureka DAB certainly has shortcomings. Nonetheless it offers more promise for the strategic, long-term development of radio as a medium of democratic communication in the digital age than any other existing option. Eureka DAB provides the same basic advantages that prompted British broadcaster-turned-consultant Charles A. Siepmann, primary author of the FCC's "Blue Book," to refer to FM as "radio's second chance" (1946). Although the FM dial has been thoroughly exploited by commercial operators, and only part of its great social promise has been realized, the adoption of FM technology did make possible the development of the U.S. public radio system.

IBOC is, on the contrary, a tactical move, a short-term corporate survival kit and, perhaps, an obstacle to further development of radio as a digital medium. In 1999, the FCC noted that the options of IBOC and ”new-spectrum DAB” did not have to be mutually exclusive and could, in fact, be complementary. (FCC 1999, 17) It is worth remembering the words of iBiquity president Robert Struble himself: “There is no reason… why Eureka [DAB] and IBOC couldn’t exist side-by-side. *It depends on what you want to do with that spectrum*” (quoted in Lavers 2000, italics added).

Notes

[1] The Wiesbaden agreement in 1995 actually allocated channels for T-DAB within four different frequency bands: Band I (47-68 MHz), Band II (87,5 –108 MHz) (current analog FM band), Band III (174-240 MHz) (current analog VHF television band) and the L-Band (1452-1492 MHz) (O’Leary 2000, 215).

[2] ”Radio’s Second Chance” (1946) was Charles Siepmann’s book about the state of the U.S. radio industry, dominated by commecial operators and the great social potential of FM radio. (Siepmann 1946, 239- 253; Walker 2001, 43-44)

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